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【Title of the Invention】 STEERING COLUMN APPARATUS

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【List of Filed Materials】

【Material】	Specification	1
【Material】	Drawings	1
【Material】	Abstract	1
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【Proof Requirement】	Required	

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02NSP070 2002-217010

[Name of the Document] Specification

[Title of the Invention] Steering Column Apparatus

[What is Claimed is]

[Claim 1]

A steering column apparatus comprising:

a cylindrical steering column for supporting a steering shaft to be rotatable therein;

a vehicle body-side bracket mounted for pressing and fixing this steering column; and

a distance unit formed to be expanded from the steering column by plastic working and having a pair of pressed portions to be pressed by said body-side bracket,

wherein a position of said steering column with respect to said body-side bracket is adjustable within a predetermined range,

said steering column apparatus being characterized in that:

said steering column is formed with a reinforcement convex or concave portion in at least one of an upper part and a lower part of said pressed portions for coupling said pressed portions together in order to enhance the clamping rigidity of said distance unit with respect to said body-side bracket.

[Claim 2]

A steering column apparatus according to claim 1, wherein said convex portion is comprised of a plurality of convex streaks and said concave portion is comprised of a plurality of concave streaks.

[Claim 3]

A steering column apparatus according to claim 1 or 2, wherein said steering column is adjustable at least in one of a tilting direction or a telescopic direction with respect to said body-side bracket.

[Claim 4]

A steering column apparatus according to any one of claims 1 to 3, wherein said plastic working is performed by hydroforming.

[Detailed Description of the Invention]

[0001]

[Field of the Industrial Utilization]

The present invention relates to a steering column for constituting a steering device for a car or the like, and more specifically, to a technology for enhancing the rigidity or the like of a column distance unit while reducing the number of the constituent parts as well as the manufacturing cost.

[0002]

[Prior Art]

Since a steering apparatus of a vehicle is to be used (for steering) by many and unspecific drivers, it is desirable that the position of a steering wheel

is adjustable in compliance with the physique or the posture of each driver. In order to satisfy such desire, a tilt mechanism or a telescopic mechanism is widely employed not only for passenger cars, but also for freight cars.

[0003]

The tilt mechanism is a mechanism to adjust the position of a steering wheel in the up-and-down direction, and is constituted by a tilt pivot for rockably supporting a steering column, a tilt fixing means for fixing the steering column at a desired position (rocking angle), and the others. On the other hand, the telescopic mechanism is a mechanism for adjusting the position of the steering wheel in the back-and-forth direction (the axial direction of the steering shaft), and is constituted by an expandable unit of a double tube type or the like to be used for expansion and/or contraction of the steering shaft, a telescopic fixing means for fixing the steering shaft at a desired position (with an amount of expansion/contraction), and the others.

[0004]

Hitherto, it is general that, as the tilt fixing means, a distance bracket formed of a steel plate is connected to a steering column formed of a steel pipe by welding and this distance bracket is pressed and fixed by a body-side bracket which is

formed of a steel plate. However, with such an arrangement, the number of the constituent parts and that of the welding steps are increased, and moreover, variable inconveniences are inevitably caused by thermal distortion, etc., at the welding. As a result, it is proposed in Japanese Patent Application Laid-Open No. 10-7003 or the like (hereinafter called the prior art) a structure in which a distance unit for fixing the steering column on the body-side bracket is formed to be expanded by plastic working.

[0005]

Fig. 7 is a perspective view showing a steering column of the prior art as a single unit, and Fig. 8 is a vertical cross-sectional view of a distance unit in a steering column apparatus. This steering column 21 is formed of a steel pipe in a cylindrical form, and pressed portions 25, 27 are formed to be expanded in the lower portions of the distance unit 29 in Fig. 7 and Fig. 8. Pressed surfaces 51, 53 are formed on side surfaces of the pressed portions 25, 27, and a through hole 71 through which a tilt bolt 31 is inserted is formed on each of the pressed surfaces 51, 53. In this steering column apparatus, a nut 33 advances to the tilt bolt 31 by thread-engagement therewith upon rotation of a tilt lever 35 which is disposed on a side surface of the body-side bracket 3, so as to compress and release the steering column 21

by the use of the body-side bracket 3. According to the steering column apparatus of the prior art, it is possible to reduce the number of the constituent parts and that of the welding steps to reduce the manufacturing cost, and at the same time, to prevent inconveniences which may be caused by the thermal distortion or the like at the welding.

[0006]

[Problems to be Solved by the Invention]

However, the above-described steering column apparatus of the prior art has the following drawbacks. For example, when a driver fastens the tilt lever 35, the parts other than the pressed portions 25, 27 in the distance unit 29 (the upper and lower portions in Fig. 9) are flexed, so that the operative feeling becomes very bad and a secured fixing of the steering column 21 by the use of the body-side bracket 3 becomes unfeasible. Moreover, when the driver clamps the tilt lever 35 with a clamping force exceeding a predetermined value, the distance unit 29 may be flexed beyond the limit of its elasticity so as to be plastically deformed. Then, these inconveniences become conspicuous when the steering column is formed of a thin steel pipe, which results in an obstacle to reduction of the weight of the steering apparatus.

[0007]

The present invention has been contrived taking the above circumstances into consideration, and an object thereof is to provide a steering column apparatus which can enhance the rigidity of a distance unit while reducing the number of the constituent parts as well as the manufacturing cost.

[0008]

[Means for Solving the Problems]

In order to solve the above problems, according to claim 1 of the present invention, there is proposed a steering column apparatus comprising:

a cylindrical steering column for supporting a steering shaft to be rotatable therein;

a vehicle body-side bracket mounted for pressing and fixing this steering column; and

a distance unit formed to be expanded from the steering column by plastic working and having a pair of pressed portions to be pressed by the body-side bracket,

wherein a position of the steering column with respect to the body-side bracket is adjustable within a predetermined range,

the steering column apparatus being characterized in that:

the steering column is formed with a reinforcement convex or concave portion in at least one of an upper part and a lower part of the pressed portions for

coupling the pressed portions together in order to enhance the clamping rigidity of the distance unit with respect to the body-side bracket.

[0009]

According to claim 2 of the present invention, it is proposed that the convex portion is comprised of a plurality of convex streaks and the concave portion is comprised of a plurality of concave streaks in the steering column apparatus of claim 1.

[0010]

According to claim 3 of the present invention, it is proposed that the steering column is adjustable at least in one of a tilting direction or a telescopic direction with respect to the body-side bracket in the steering column apparatus of claim 1 or 2.

[0011]

According to claim 4 of the present invention, it is proposed that the plastic working is performed by hydroforming in the steering column apparatus according to any one of claims 1 to 3.

[0012]

According to the present invention, the rigidity of the entire distance unit is enhanced and deflection is difficult to be caused even when a great clamping force is applied on the pressed portion.

[0013]

[Detailed Description of the Preferred Embodiments]

Description will be made below on an embodiment of a steering column apparatus according to the present invention.

Fig. 1 is a side view of a steering column apparatus according to the first embodiment of the present invention, and Fig. 2 is an enlarged cross-sectional view taken along A-A line in Fig. 1. The steering column 1 is attached to a vehicle body-side strength member 7 through a fixed bracket 3 formed of a steel plate by press-forming to serve as a vehicle body-side bracket and a pivot bracket 5 formed of alluminium alloy by die casting, so as to support an upper steering shaft (hereinafter simply called the steering shaft) 13 to be rotatable through bearings 9, 11. While a steering wheel is attached to an upper end of the steering shaft 13, a lower steering shaft is coupled to a lower end of the steering shaft 13 through a universal joint. In Figs. 1 and 2, a reference numeral 15 denotes tilt adjusting holes which are formed on the fixed bracket 3.

[0014]

The steering column 1 is comprised of an upper column 21 formed of a steel pipe by hydroforming and a lower column 23 of a steel pipe fitted in the upper column 21 to be slidable. The upper column 21 is

formed with a distance unit 29 having a pair of expanded pressed portions 25, 27 laterally shown in Fig. 2 at the positions corresponding to the fixed bracket 3. The distance unit 29 is pressed and fixed by an adjusting bolt 31 inserted through the fixed bracket 3 and an adjusting nut 33 with a predetermined clamping force through the fixed bracket 3. In Figs. 1 and 2, a member denoted by reference numeral 35 is an adjusting lever which rotate and drive the adjusting nut 33. Reference numeral 37 denotes telescopic adjusting holes formed in the pressed portions 25, 27.

[0015]

On the other hand, a lower bracket 41 formed of a steel pipe by pressing is welded to the lower column 23 at a position corresponding to that of a pivot bracket 5. The lower bracket 41 is pressed by the pivot bracket 5 and is supported by a pivot bolt 43 inserted through the pivot bracket 5 and a nut 45.

[0016]

The steering column 1 is arranged to be rockable around the pivot bolt 43. The driver can adjust a vertical position of the steering wheel (in the up-and-down direction in Fig. 1) within a range in which the adjusting bolt 31 is moved in the tilt adjusting holes 15 by operating the adjusting lever 35. Moreover, the upper column 21 is slidable with

respect to the lower column 23, so that the driver can adjust the front and back positions of the steering wheel (in the right-and-left direction in Fig. 1) within a range in which the adjusting bolt 31 is moved in the holes 37 for telescopic adjustment by operating the adjusting lever 35.

[0017]

On the upper column 21 of the present embodiment, the pressed portions 25, 27 are formed with the pressed surfaces 51, 53 which are brought into contact with the inner surfaces of the fixed bracket 3, and three beads 55, 57 are formed, respectively, on an upper part and a lower part of the distance unit 29. Fig. 3 is a perspective view of this arrangement, while Fig. 4 shows a side view thereof. Each of the beads 55, 57 is formed to couple the pressed portions 25, 27 together.

[0018]

A mode of an operation of the present embodiment will be described in the following.

When the position of the steering wheel becomes inappropriate because of a change of drivers, or the like, with the steering column apparatus of the first embodiment, first the driver rotates the adjusting lever 35 clockwise to loosen the adjusting nut 33 with respect to the adjusting bolt 31. Then, the axial force of the adjusting bolt 31 which has worked

on the distance unit 29 of the upper column 21 through the fixed bracket 3 is extinguished so that the steering column 1 is allowed to rock in a predetermined amount around the pivot bolt 43 and, at the same time, the upper column 21 is also allowed to slide in a predetermined amount which is determined by the elongated holes 37, 37 with respect to the lower column 23. With this operation, the driver can tiltingly or telescopically move the steering column 1 to adjust the steering wheel to a desired position.

[0019]

Upon completion of the positional adjustment of the steering wheel, the driver rotates the adjusting lever 35 counter-clockwise to clamp the adjusting nut 33 with respect to the adjusting bolt 31. Then, a predetermined axial force is generated in the adjusting bolt 31 so that the inner surfaces of the fixed bracket 3 are brought into pressure contact with the pressed surfaces 51, 53 of the distance unit 29. As a result, the upper column 21 (that is, the steering wheel) is fixed at a desired position with respect to the fixed bracket 3.

[0020]

On this occasion, since the beads 55, 57 for coupling the pressed portions 25, 27 are provided in an upper part and a lower part of the distance unit 29 in the present embodiment, the rigidity of the

distance unit 29 is conspicuously high, compared with that of the prior art described above. With this structure, the upper column 21 can be supported by the fixed bracket 3 without fail, and a vibration of the steering shaft 13 and that of the steering wheel in running can be suppressed. In addition, an unintentional movement of the upper column 21 and the like at collision of the car is difficult to occur. If an excessive axial force is generated in the adjusting bolt 31 when the adjusting lever 35 is clamped by a strong clamping force, elastic or plastic deformation of the distance unit 29 is difficult to occur so that a stable clamping is feasible for a long time.

[0021]

Fig. 5 is a perspective view showing the second embodiment, and Fig. 6 is a perspective view showing the third embodiment. Each of these embodiments employs a structure substantially the same as that of the first embodiment. However, in the second embodiment three grooves 61 are formed on the distance unit 29, instead of the beads. On the other hand, a wide band type convex portion 63 is provided on the distance unit 29 in the third embodiment. These grooves 61 and the convex portion 63 are formed, in the similar manner as in the first embodiment, to connect the pressed portions 25, 27 and a mode of

operation thereof is also the same as that in the first embodiment.

[0022]

Specific description of the embodiments are as stated above. However, embodiments of the present invention are not limited to those described above. For example, the shape and the number of the convex portion or the concave portion for connecting the pressed portions can be properly determined in accordance with designing reasons, or the like. In addition, these convex and concave portions may be provided only on the upper side or on the lower side of the pressed portions. The steering column may be plastically processed by another work other than hydroforming. In the embodiments described above, the present invention is applied to a steering column apparatus of a telescopic type. However, the present invention may be applied to a steering column apparatus which is provided only with a tilting mechanism or only with a telescopic mechanism. Specific structures of the steering apparatus and the material, the shape, and the like, of each of the constituent parts thereof can be properly changed within the scope and spirit of the present invention.

[0023]

[Effect of the Invention]

As described above, the steering column

apparatus of the present invention comprises a cylindrical steering column for supporting a steering shaft to be rotatable therein, a vehicle body-side bracket mounted for pressing and fixing this steering column, and a distance unit formed to be expanded from the steering column by plastic working and having a pair of pressed portions to be pressed by the body-side bracket, in which a position of the steering column with respect to the body-side bracket is adjustable within a predetermined range, and this steering column apparatus is characterized in that the steering column is formed with a reinforcement convex or concave portion in at least one of an upper part and a lower part of the pressed portions for coupling the pressed portions together in order to enhance the clamping rigidity of the distance unit with respect to the body-side bracket. As a result, the rigidity of the whole column distance unit which is pressed and supported by the body-side bracket is improved and is difficult to be deflected even if a great clamping force is applied onto the pressed portion, the steering column can be supported by the body-side bracket without fail, a vibration of the steering shaft or that of the steering wheel in running can be suppressed, and an unintentional movement of the steering column or the like at a collision of the car scarcely occur.

[Brief Description of the Drawings]

[Figure 1]

A side view of a steering column apparatus according to the first embodiment.

[Figure 2]

An enlarged cross-sectional view taken along A-A line in Fig. 1.

[Figure 3]

A perspective view of an upper column according to the first embodiment.

[Figure 4]

A side view of the upper column according to the first embodiment.

[Figure 5]

A perspective view of an upper column according to the second embodiment.

[Figure 6]

A perspective view of an upper column according to the third embodiment.

[Figure 7]

A perspective view of a steering column as a single unit according to the prior art.

[Figure 8]

A longitudinal cross-sectional view of the distance unit of the steering column according to the prior art.

[Figure 9]

A longitudinal cross-sectional view for showing a variation of the distance unit of the steering column according to the prior art.

[Description of Reference Numerals or Symbols]

1 … steering column

3 … fixed bracket

13 … steering shaft

21 … upper column

29 … distance unit

25, 27 … pressed portions

31 … adjusting bolt

33 … adjusting nut

35 … adjusting lever

51, 53 … pressed surfaces

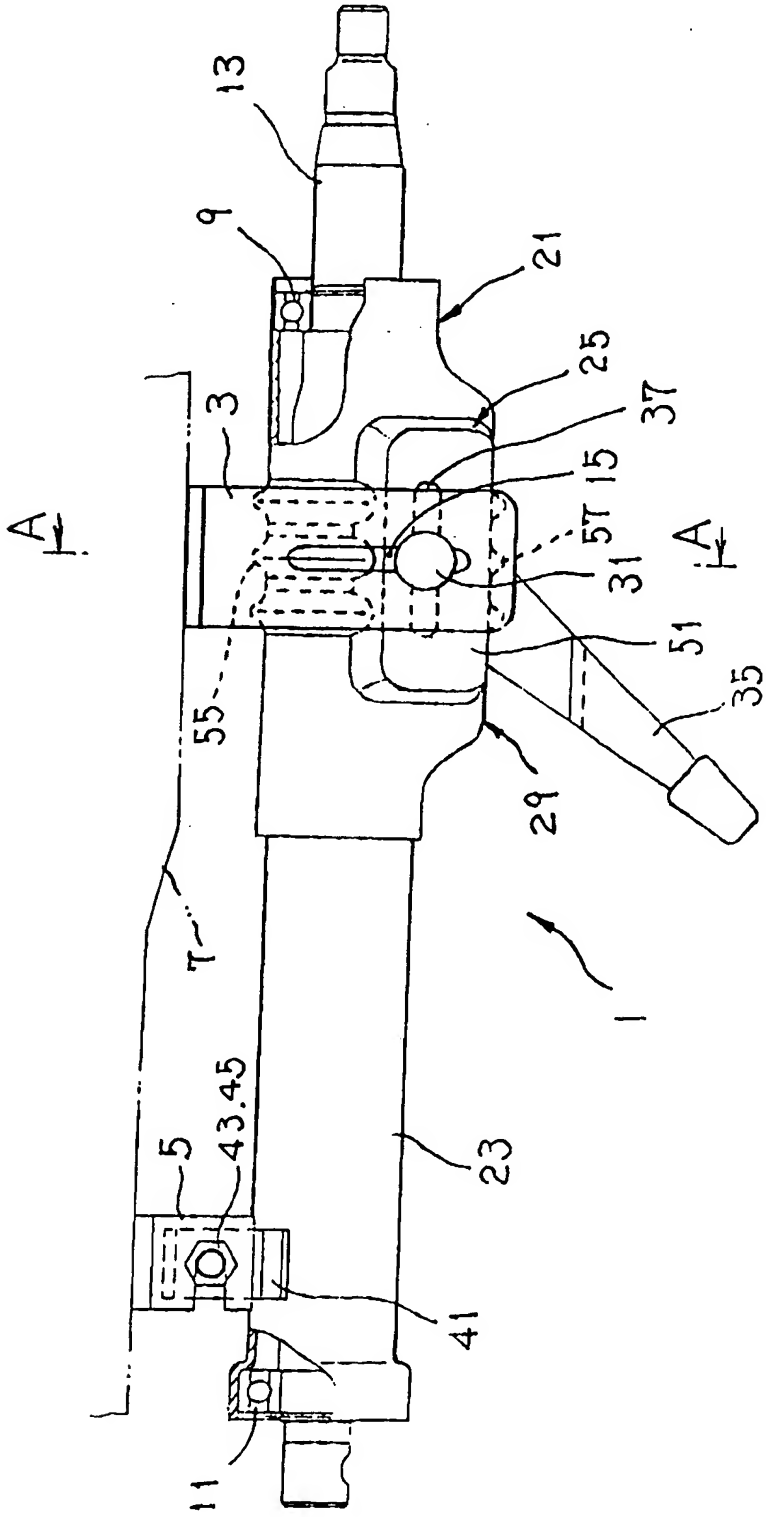
55, 57 … beads

61 … grooves

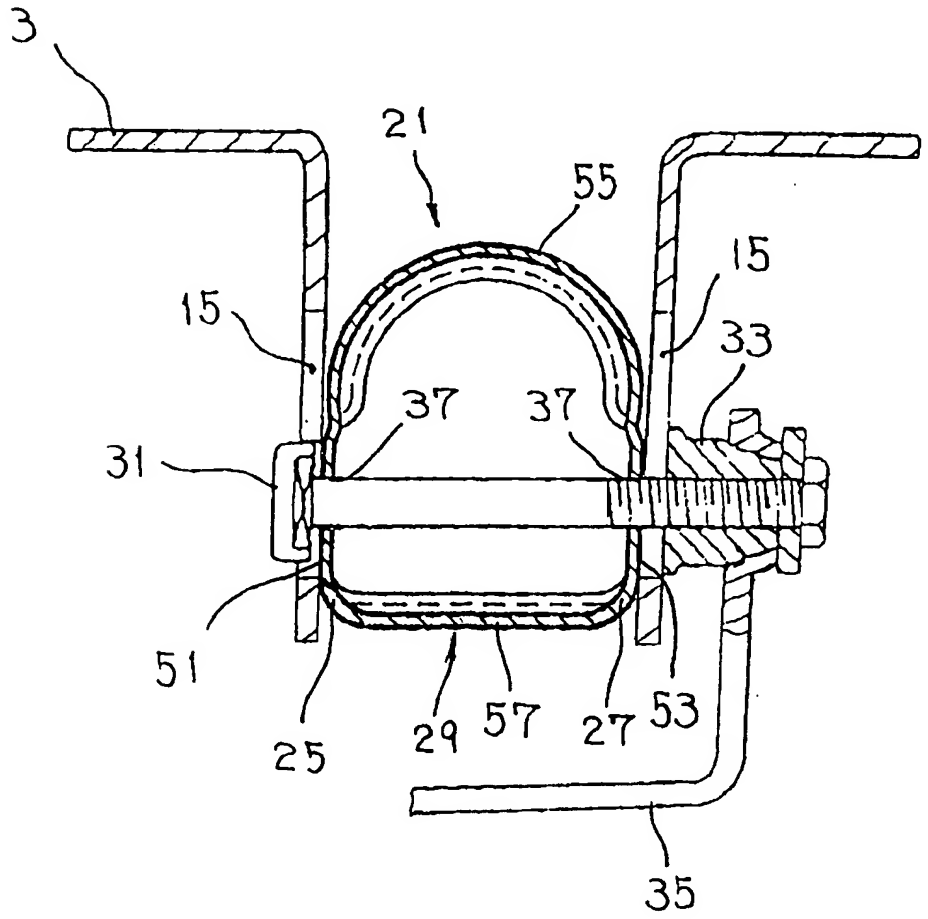
63 … convex portions

【書類名】　図面　[Name of the Document] Drawings

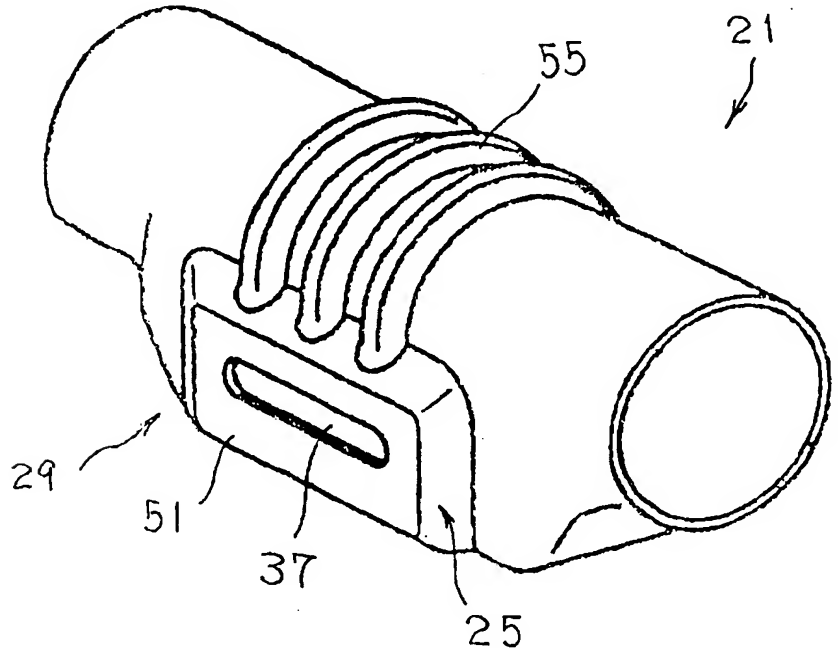
【図１】　Fig. 1



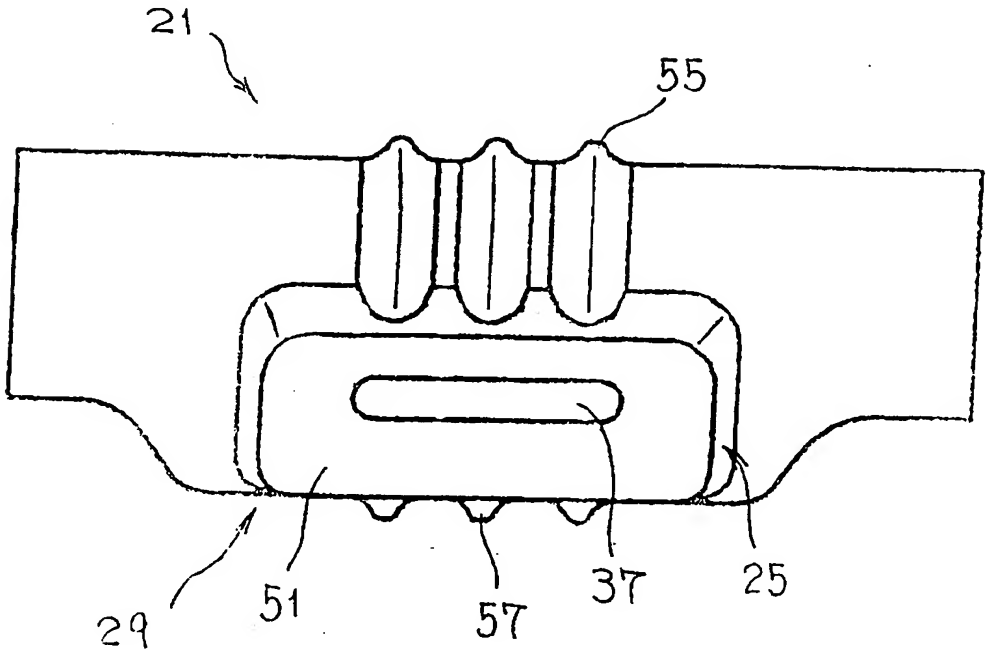
【図２】 Fig. 2



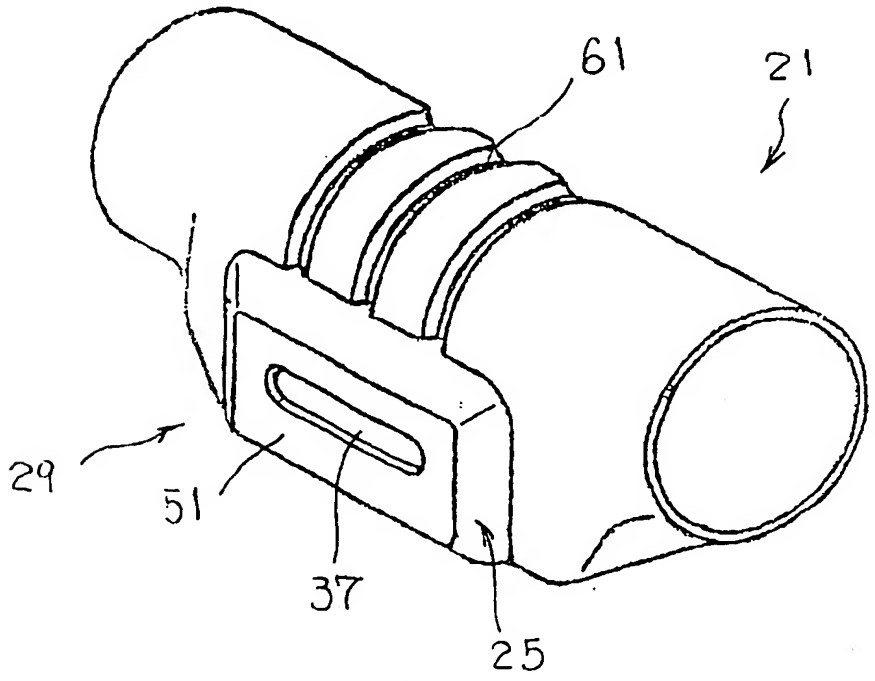
【図３】 Fig.3



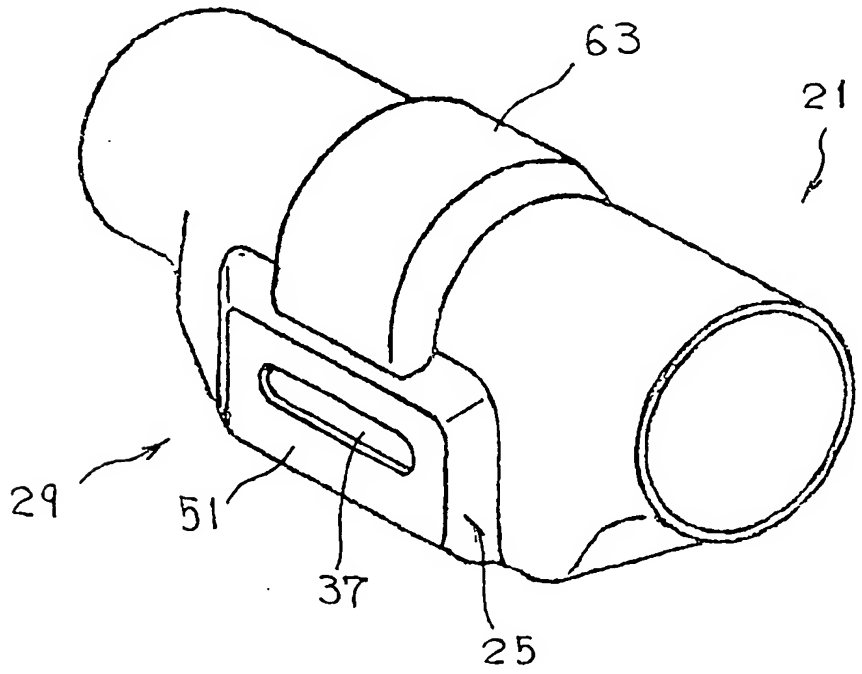
【図４】 Fig. 4



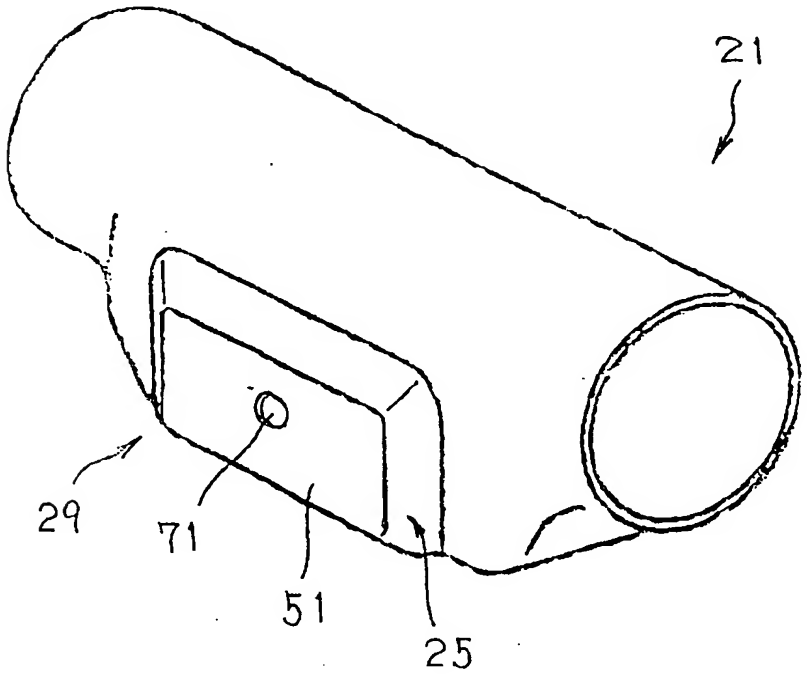
【図５】 Fig.5



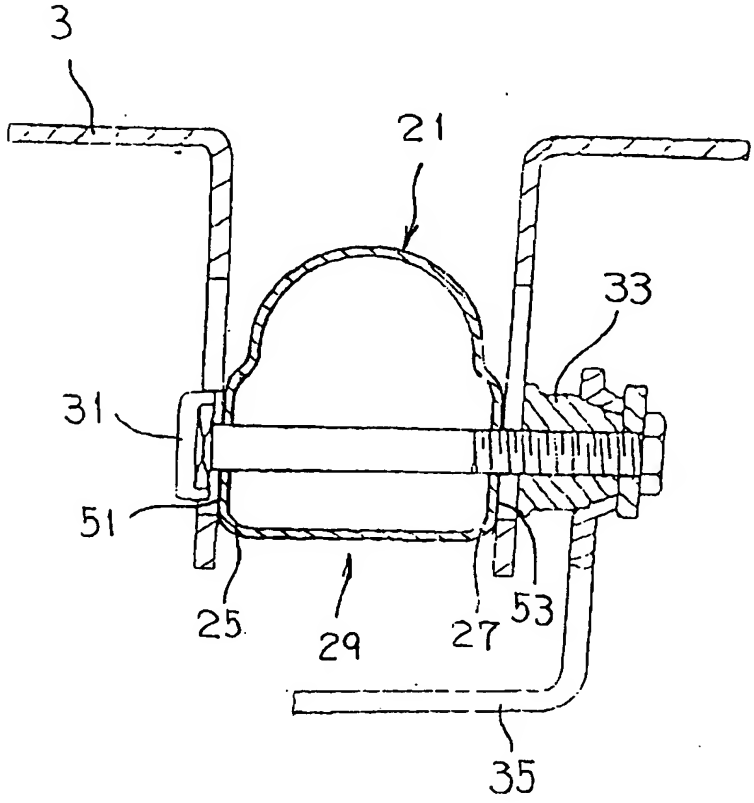
【図６】 Fig. 6



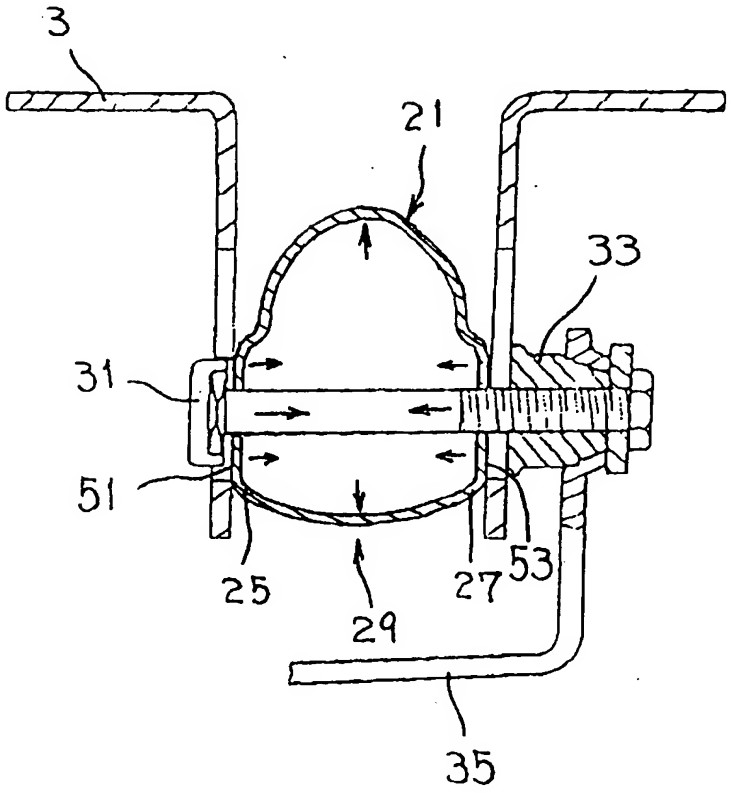
【図７】 Fig. 7



【図８】 Fig. 8



【図９】　Fig. 9



[Name of the Document] Abstract

[Abstract]

[Object]

An object of the present invention is to provide a steering column capable of enhancing the rigidity or the like of a column distance unit while reducing the number of the constituent parts as well as the manufacturing cost.

[Means for Achieving the Object]

On an upper column 21, there is formed a distance portion 29 having a pair of pressed portions 25, 27 formed to be expanded at positions corresponding to the fixed bracket 3. On the upper column 21, pressed surfaces 51, 53 which are brought into contact with the inner surfaces of the fixed bracket 3 are formed in the pressed portions 25, 27, and three beads 55, 57 are formed, respectively, on an upper part and a lower part of the distance unit 29. The beads 55, 57 are formed to couple the pressed portions 25, 27 together.

[Elected Drawing] Figure 2